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M-DE 8000.005C

MANNED SPACE FLIGHT

PROGRAM DIRECTIVE

APOLLO FLIGHT MISSION ASSIGNMENTS (U)

JULY 21, 1964

[redacted]

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON, D.C.

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APOLLO FLIGHT MISSION ASSIGNMENTS (U)

Date Effective:

July 21, 1964

GROUP [redacted] Downgraded at 3 year intervals; declassified after [redacted] years

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Manned Space Flight
National Aeronautics and Space Administration
Washington, D. C.

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MANNED SPACE FLIGHT

DIRECTIVE

M-DE 8000.005C

PROGRAM REQUIREMENT DOCUMENT

This document is an official release of Manned Space Flight and its requirements shall be implemented by all cognizant elements of the Manned Space Flight Program.

The effective date of this document is July 21, 1964

Approved: G E Mueller

Associate Administrator for
Manned Space Flight

Limit Access to:
Cognizant NASA and
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INTRODUCTION

This document contains flight mission assignments for the Apollo/Little Joe II and Apollo/Saturn flight programs. Issue B of this document dated March 23, 1964 is superceded by this issue.

Proposed changes to this document shall be submitted to MSF for review and coordination. The Apollo Flight Mission Assignments document will be revised, as required, to reflect approved changes and to complete mission definitions.

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APOLLO FLIGHT MISSION ASSIGNMENTS
LITTLE JOE II

MISSION TYPE		MAX. Q. ABORT	HIGH ALTITUDE ABORT
OBJECTIVES		1. EVALUATE LAUNCH ESCAPE VEHICLE STABILITY, STRUCTURAL PERFORMANCE AND EFFECTS OF JET PLUME IMPINGEMENT. 2. EVALUATE CANARD DEPLOYMENT AND TURN-AROUND DYNAMICS. 3. EVALUATE LES AND CM SEPARATION AND PERFORMANCE OF EARTH LANDING SYSTEM. 4. DETERMINE AERODYNAMIC LOADS DURING LAUNCH ENVIRONMENT.	1. EVALUATE PERFORMANCE OF LAUNCH ESCAPE VEHICLE WITH CANARD PRIOR TO TOWER JETTISON. 2. DEMONSTRATE TOWER AND BOOST PROTECTIVE COVER JETTISON AFTER HIGH ALTITUDE RE-ENTRY ENVIRONMENT. 3. DETERMINE AERODYNAMIC LOADS DURING LAUNCH ENVIRONMENT.
SPACECRAFT		BP-23 (SIMULATED BLOCK I CSM AND LES)	BP-22 (SIMULATED BLOCK I CSM AND LES)
LAUNCH VEHICLE		3	4
LAUNCH DATE		DECEMBER - 1964	MAY - 1965
TEST CONDITIONS	ALTITUDE (FEET)	30,000 - 39,000	100,000 - 120,000
	DYNAMIC PRESS. (PSF)	680 - 880	100 - 125
	MACH NUMBER	1.25 - 1.75	3.75 - 4.25

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APOLLO FLIGHT MISSION ASSIGNMENTS - LITTLE JOE II

MISSION TYPE		INTERMEDIATE ALTITUDE ABORT	PAD ABORT	ABORT QUALIFICATION	
OBJECTIVES		1. DETERMINE STRUCTURAL INTEGRITY OF CM AND BOOST PROTECTIVE COVER DURING TUMBLING ABORT. 2. DETERMINE CANARD DEPLOYMENT DURING TUMBLING ABORT. 3. DETERMINE STRUCTURAL INTEGRITY THROUGH SIMULATED SATURN V LAUNCH ENVIRONMENT.	LOW ALTITUDE DEMONSTRATION OF THE CANARD, SEQUENCER, AND LES JETTISON WITH BOOST PROTECTIVE COVER.	QUALIFICATION OF BLOCK II CM LAUNCH ESCAPE AND PARACHUTE RECOVERY SYSTEMS.	
SPACECRAFT		002 (BLOCK I CSM)	010 OR BP-23 (REWORKED) (BLOCK I CSM) (NOTE 1)	024 (BLOCK II CSM) (NOTE 2)	026
LAUNCH VEHICLE		5	-	7	8
LAUNCH DATE		SEPTEMBER - 1965	FEBRUARY - 1966	1967	1967
TEST CONDITIONS	ALTITUDE (FEET)	60,000 TO 75,000	0	TO BE DETERMINED	
	DYNAMIC PRESS. (PSF)	300 TO 470	0	TO BE DETERMINED	
	MACH NUMBER	2.4 - 3.0	0	TO BE DETERMINED	

NOTE 1: AFM 010 AND LITTLE JOE II #6 ARE PROVIDED AS A BACKUP FOR BP-23, BP-22, OR AFM 002. REWORKED BP-23 WILL BE MADE AVAILABLE IN CASE AFM 010 IS REQUIRED FOR A BACKUP FLIGHT ABORT MISSION.

NOTE 2: THE NEED FOR THESE FLIGHTS WILL BE DETERMINED WHEN BLOCK II CONFIGURATION IS DEFINED.

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APOLLO FLIGHT MISSION ASSIGNMENTS – SATURN I

MISSION TYPE		APOLLO DEVELOPMENT	MICROMETEOROID EXPERIMENTS		
OBJECTIVES		1. L/V TECHNOLOGY DEVELOPMENT. (LH_2 PROPULSION AND STAGE SEPARATION) 2. L/V GUIDANCE. 3. LAUNCH ENVIRONMENT. 4. DEMONSTRATE LES UNDER FLIGHT CONDITIONS.	1. MICROMETEOROID EXPERIMENTS 2. L/V TECHNOLOGY DEVELOPMENT. (LH_2 PROPULSION AND STAGE SEPARATION) 3. L/V GUIDANCE.		
SPACECRAFT		BP-15	BP-16 AND MICROMETEOROID EXPERIMENT	BP-26 AND MICROMETEOROID EXPERIMENT	BP-9 AND MICROMETEOROID EXPERIMENT
PAYLOAD REQUIREMENT (NOTE 1)		17,000 LBS.	16,000 LBS.	16,000 LBS.	16,000 LBS
LAUNCH VEHICLE		SA-7	SA-9	SA-8	SA-10
LAUNCH DATE		SEPTEMBER - 1964	DECEMBER - 1964	MARCH - 1965	JUNE - 1965
PROFILE		INSERT INTO ELLIPTICAL ORBIT OF APPROX. 100/115 N.MI. NO RECOVERY.	INSERT INTO ELLIPTICAL ORBIT OF APPROX. 270/405 N.MI. NO RECOVERY.		
FLIGHT DATA	LAUNCH AZIMUTH	105 DEGREES	105 DEGREES		
	DURATION	> 3 ORBITS	1 YEAR		
	TRACKING NETWORK	AMR	AMR		

NOTE 1: REQUIREMENT IN ORBIT. THE L/V SHALL HAVE A PAYLOAD CAPABILITY WHICH EXCEEDS THE PAYLOAD REQUIREMENT BY AT LEAST THE AMOUNT REQUIRED TO CARRY A LES UNTIL JETTISONED.

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DISCUSSION OF SATURN IB AND SATURN V PROGRAM

Saturn IB and Saturn V Apollo test flights provide for launch vehicle and spacecraft development and for demonstration of crew performance. These test flights and the lunar missions are summarized on the following three charts which describe flight missions and flight mission assignments.

APOLLO FLIGHT MISSIONS

The two Apollo Flight Mission charts cover the five test mission types and the lunar mission. The three mission types shown on page 8 use the Saturn IB launch vehicle to demonstrate operation of the complete spacecraft with limited propellant loading. The first Saturn V mission summarized on page 9 verifies entry at lunar return velocity. The remaining Saturn V missions cover the lunar mission simulations and the lunar missions. Launch vehicle development objectives are included in the first mission type for each vehicle.

The charts indicate the launch vehicles and spacecraft that shall be configured for performance of each mission type. In addition to the spacecraft listed on the charts, dummy (boilerplate) spacecraft are being considered for use in the event of major space vehicle problems. Consideration is also being given to the use of Block I CSM's on vehicles 206, 501 and 502.

At least two flights each of the "L/V-CSM Development" (Saturn IB) and the "L/V and Heat Shield Development" (Saturn V) missions are required for launch vehicle development objectives. Also, two flights of the "CSM-LEM Operations" mission are planned. Additional launch vehicles and spacecraft identified under

each mission type provide for contingency and/or repeated flights. The objectives of the contingency flights may be altered to focus on the problems being encountered. Repeat flights of the "CSM-LEM Operations" mission can provide crew training opportunities using the Saturn IB vehicle if required.

The "L/V-CSM Development" (Saturn IB) and the "L/V and Heat Shield Development" (Saturn V) missions require a mission programmer located in the CSM to achieve flight objectives. A mission programmer for the LEM shall be available for flights of the "CSM-LEM Operations" mission.

Water landings and CM recovery are to be planned for all Apollo flight test missions in the Saturn IB and Saturn V series.

APOLLO FLIGHT MISSION ASSIGNMENTS

The Apollo Flight Mission Assignments chart on page 10 shows the allocation of launch vehicles to the flight missions. The spacecraft available for assigned flight missions in the Saturn IB and Saturn V programs are also shown. The launch dates are those in the Manned Space Flight Schedules of January, 1964.

The requirement for two development flights of the Saturn IB and Saturn V launch vehicles establishes flights 203 and 503, respectively, as the first opportunities for the manned "CSM Long Duration Operation" (Saturn IB) and the manned "Lunar Mission Simulation" (Saturn V) missions. Availability of the LEM and a CSM with docking facilities sets flight 206 as the first opportunity for a manned "CSM-LEM Operations" (Saturn IB) mission. If LEM's and CSM's with docking structures become available for use on flights prior to 206, consideration will be given to combining unattained objectives of the "CSM Long Duration

Operations" mission with the "CSM-LEM Operations" mission.

It is planned that spacecraft test flights on the Saturn IB will be transferred to the Saturn V as soon as that vehicle is capable of being manned. As a result, Saturn IB launch vehicles may become available for other uses. Consideration is being given to alternate payloads for Saturn IB vehicles 207 through 212.

Launch schedules during the period of overlap between the Saturn IB and the Saturn V programs will be adjusted, where required, to conform to the availability for launch of six complete spacecraft per year.

Where alternate missions have been assigned to the same launch vehicle, the spacecraft and the launch vehicle shall be capable of performing either mission. In addition, all spacecraft shall be capable of flight missions on either the Saturn IB or Saturn V launch vehicle without significant modification.

In succeeding issues of this document the missions will be defined further. In addition, requirements for major program decisions, including lead times, will be identified.

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APOLLO FLIGHT MISSIONS - SATURN IB

MISSION TYPE	L/V - CSM DEVELOPMENT				CSM LONG DURATION OPERATIONS		CSM-LEM OPERATIONS	
OBJECTIVES	1. L/V DEVELOPMENT. 2. S-IVB AND INSTRUMENT UNIT CHECKOUT. 3. COMPATIBILITY AND STRUCTURAL INTEGRITY OF CSM-SATURN IB. 4. VERIFICATION OF CSM SYSTEMS OPERATION (RCS, SCS, SPS, ECS, EPS, COMMUNICATIONS, AND G & N SYSTEMS). 5. HEAT SHIELD VERIFICATION AT APPROXIMATELY 29,000 FPS: (A) MAX. HEAT RATE. (B) MAX. HEAT LOAD.				1. MAN/SYSTEM INTERFACES. 2. DEMONSTRATE CREW/CSM/GROUND SYSTEMS PERFORMANCE FOR EXTENDED MISSION. 3. S-IVB AND INSTRUMENT UNIT CHECKOUT IN ORBIT.		1. TRANSPOSITION AND DOCK. 2. CREW TRANSFER. 3. VERIFICATION OF LEM SYSTEMS OPERATION. 4. RENDEZVOUS AND DOCK. 5. CREW/LEM/GROUND SYSTEMS OPERATION VERIFICATION. 6. MAN/SYSTEM INTERFACES.	
SPACECRAFT	CSM (BLOCK I)	LEM	CSM (BLOCK I)	LEM	CSM (BLOCK I)	LEM	CSM (BLOCK II)	LEM
	009, 012, 014 015		011, 012 014, 015		012, 014 015		021, 025, 032, 030, 034 (NOTE 4)	1, 2, 3, 4, 5
PAYLOAD REQUIREMENT (NOTE 1)	39,500 LBS. (NON ORBITAL)		(NON ORBITAL) (NOTE 2)		32,000 LBS.		35,500 LBS. (NOTE 3)	
LAUNCH VEHICLES	201, 203 THROUGH 205		202 THROUGH 205		203 THROUGH 205		206 THROUGH 210 (NOTE 5)	
PROFILE TYPES	I POWERED FLIGHT OF L/V ON NON-ORBITAL SUPER-CIRCULAR ENTRY "LOB-TYPE" TRAJECTORY CSM/S-IV B SEPARATION. USE SPS TO ACHIEVE DESIRED ENTRY CONDITIONS FOR MAX. HEAT RATE.		II POWERED FLIGHT OF L/V ON NON-ORBITAL SUPER-CIRCULAR ENTRY "LOB-TYPE'TRAJECTORY CSM/S-IVB SEPARATION. USE SPS TO ACHIEVE DESIRED ENTRY CONDITIONS FOR MAX. HEAT LOAD.		INSERT INTO 105 N. MI. CIRCULAR ORBIT. CSM/S-IVB SEPARATION. USE SPS TO ACHIEVE HIGHER ORBIT REQUIRED FOR LONG DURATION MISSION. DE-ORBIT WITH SPS. ENTRY.		INSERT INTO 105 N. MI. CIRCULAR ORBIT. TRANSPOSITION AND DOCK. SPACECRAFT/S-IVB SEPARATION. I: DOCKING OPERATIONS. RENDEZVOUS AND DOCK. (CSM ACTIVE) LEM PROPULSION OPERATIONS. II: RENDEZVOUS AND DOCK OPERATIONS. (LEM ACTIVE) DE-ORBIT WITH SPS. ENTRY.	
FLIGHT DATA — LAUNCH AZIMUTH	105 DEGREES		(NOTE 2)		72 DEGREES		72 DEGREES	
FLIGHT DATA — DURATION	—		—		UP TO 14 DAYS		UP TO 3 DAYS	
FLIGHT DATA — TRACKING NETWORK	AMR		(NOTE 2)		MSFN		MSFN	

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NOTE 1: WEIGHT OF SPACECRAFT AND ADAPTER AT LV/SC SEPARATION. THE L/V SHALL HAVE A PAYLOAD CAPABILITY WHICH EXCEEDS THE PAYLOAD REQUIREMENT BY AT LEAST THE AMOUNT REQUIRED TO CARRY A CONTROL WEIGHT LES OF 8,200 LBS. UNTIL JETTISONED.

NOTE 2: UNDER STUDY.

NOTE 3: PAYLOAD REQUIREMENT IS UNDER STUDY

NOTE 4: USE OF A BLOCK I CSM AND A CHANGE IN PROFILE TYPE IS UNDER STUDY FOR 206.

NOTE 5: 211 AND 212 ARE PROVIDED AS BACKUP LAUNCH VEHICLES.

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APOLLO FLIGHT MISSIONS – SATURN V

MISSION TYPE	L/V & HEAT SHIELD DEVELOPMENT		LUNAR MISSION SIMULATIONS AND LUNAR MISSIONS			
OBJECTIVES	1. L/V DEVELOPMENT. 2. COMPATIBILITY AND STRUCTURAL INTEGRITY OF SPACECRAFT - SATURN V. 3. HEAT SHIELD VERIFICATION AT 36,000 FPS. 4. VERIFICATION OF LAUNCH AND GROUND SUPPORT EQUIPMENT.		1. CREW/SPACE VEHICLE/GROUND SYSTEMS VERIFICATION DURING SIMULATED LUNAR MISSION. 2. LUNAR EXPLORATION.			
SPACECRAFT	CSM (BLOCK II)	LEM	CSM (BLOCK II)	LEM	CSM (BLOCK II)	LEM
	018,023 —,—,—,— (NOTE 1)	STRUCTURE, STRUCTURE, —,—,—,—	025	2	032,030, 034,036, 037,038 —,—,—,—,—,—	3,4,5,6,7,8 —,—,—,—,—,—
PAYLOAD REQUIREMENT	85,000 LBS. (NOTE 2)		85,000 LBS. (NOTE 2)		94,000 LBS. (NOTE 3)	
LAUNCH VEHICLES	501 THROUGH 506		503		504 THROUGH 515	
PROFILE TYPES	INSERT INTO 100 N. MI. CIRCULAR ORBIT. AFTER ORBITAL CHECKOUT FOR 1-3 ORBITS, INJECT INTO ELLIPTICAL TRAJECTORY. CSM/S-IVB SEPARATION. USE SPS TO ACHIEVE DESIRED ENTRY CONDITIONS.		I SIMULATION PROFILE TO BE DEVELOPED		II SIMULATIONS PROFILE TO BE DEVELOPED	III LUNAR MISSIONS INSERT INTO 100 N. MI. CIRCULAR ORBIT. AFTER ORBITAL CHECKOUT OF 1 - 3 ORBITS, INJECT INTO TRANSLUNAR TRAJECTORY. TRANSPOSITION AND DOCK. SPACECRAFT/S-IVB SEPARATION. MIDCOURSE CORRECTIONS AND DEBOOST INTO LUNAR ORBIT BY SPS. LEM SEPARATION, DESCENT AND TOUCHDOWN. LUNAR LAUNCH, RENDEZVOUS AND DOCK. LEM SEPARATION. USE SPS FOR BOOST OUT OF LUNAR ORBIT AND MIDCOURSE CORRECTIONS. ENTRY
FLIGHT DATA LAUNCH AZIMUTH	72 DEGREES		72 DEGREES		72 DEGREES	72 TO 108 DEGREES
FLIGHT DATA DURATION	1 - 3 ORBITS		7-10 DAYS		7-10 DAYS	
FLIGHT DATA TRACKING NETWORK	MSFN		MSFN		MSFN	

NOTE 1: CSM 029 IS A BACK-UP FOR HEAT SHIELD TESTS.
USE OF A BLOCK I CSM FOR 501 AND 502 IS UNDER STUDY.

NOTE 2: WEIGHT OF SPACECRAFT AND ADAPTER AT LV/SC SEPARATION. THE L/V SHALL HAVE A PAYLOAD CAPABILITY WHICH EXCEEDS THE PAYLOAD REQUIREMENT BY AT LEAST THE AMOUNT REQUIRED TO CARRY A CONTROL WEIGHT LES OF 8,200 LBS. UNTIL JETTISONED.

NOTE 3: WEIGHT OF SPACECRAFT AND ADAPTER AT LV/SC SEPARATION. THE L/V SHALL HAVE A PAYLOAD CAPABILITY WHICH EXCEEDS THE PAYLOAD REQUIREMENT BY AT LEAST 1,000 LBS. AND THE AMOUNT REQUIRED TO CARRY A CONTROL WEIGHT LES OF 8,200 LBS. UNTIL JETTISONED. LAUNCH VEHICLES 504 AND 505 PRESENTLY HAVE A PAYLOAD CAPABILITY OF 93,000 LBS. DUE TO REMOVABLE R&D INSTRUMENTATION.

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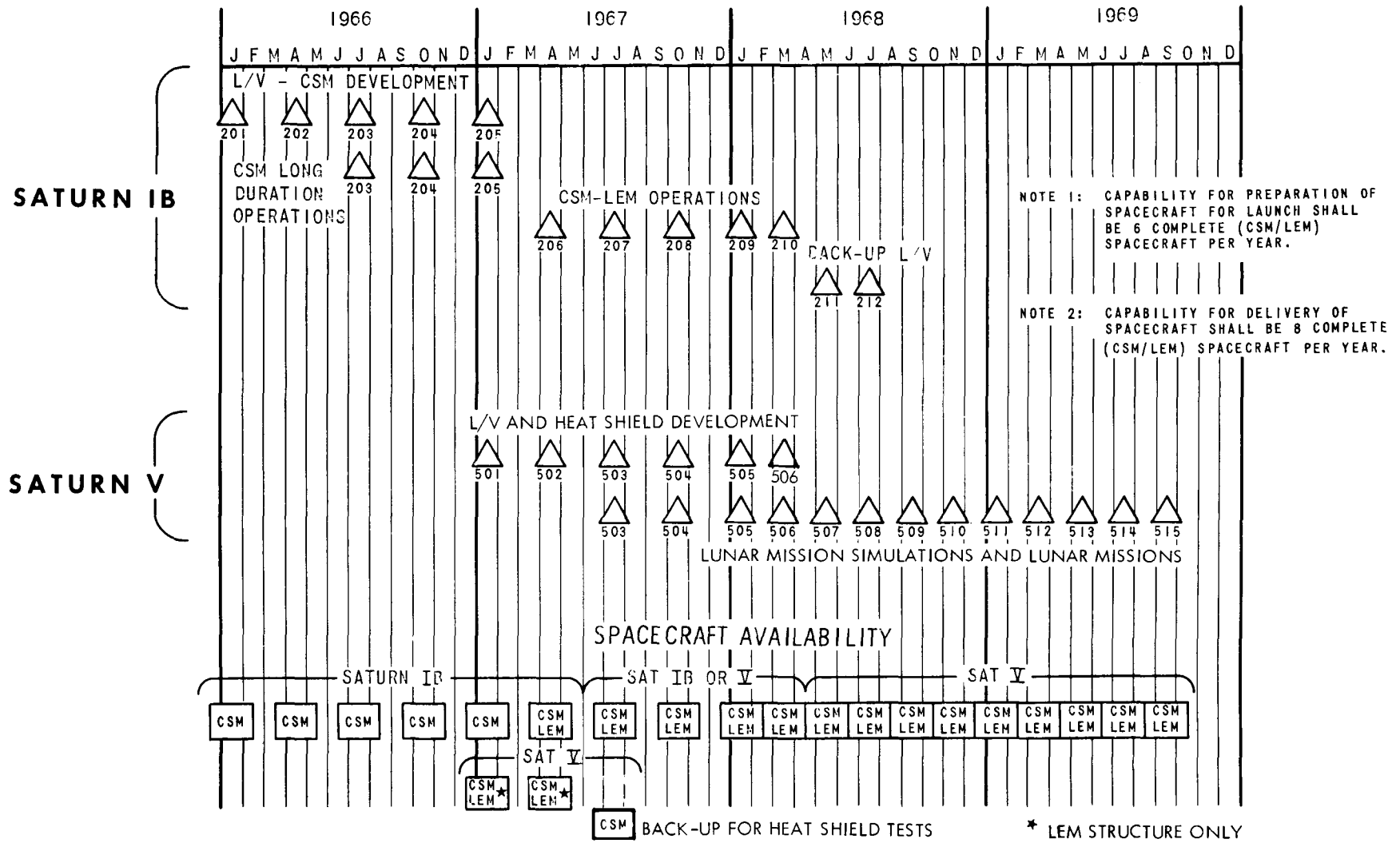
APOLLO FLIGHT MISSION ASSIGNMENTS



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